

Down's Syndrome and Maternal Age in British Columbia, 1972-75

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The occurrence of Down's syndrome in British Columbia during the period 1972-75 is analyzed with respect to maternal age distribution. This period is compared with previously studied periods. No marked trends are evident in the various age group-specific rates studied. The significance of these findings is discussed in connection with a possible role of environmental mutagens in induction of Down's syndrome and the maternal age effect.

Introduction

The data in this paper constitute an extension of the 1976 work by Lowry et al. (1), which concerned Down's syndrome (DS) and maternal age in British Columbia from 1952 to 1973. That study was structured upon five four-year periods ending in 1971, and a single two-year period, 1972-73, and the present study merely extends the final period into a four-year period, 1972-75, to provide a more complete unit for comparison purposes.

This paper was assembled to facilitate the study of long term trends in the incidence and maternal age distribution of DS, in connection with the possible role of environmental agents as mutagens capable of producing human aneuploidy. A simple hypothesis would attribute all nondisjunction-caused aneuploidy to the cumulative effects of exposure of oocytes to environmental mutagens. This hypothesis also accounts for the well-known maternal age effect found for DS. Chromosome aneuploidies induced in such a manner should show up in the population during the same generation, unlike gene mutations which would not be detected until several generations have passed. Furthermore, DS provides a

readily identifiable phenotype which can be used to monitor aneuploid production in populations. In British Columbia, the BC Health Surveillance Registry contains listings of DS for the past 26 years, and these form the basis of the present study.

Material and Methods

DS cases for 1974 and 1975 were ascertained from a listing of the Health Surveillance Registry caseload to year-end 1975, as well as from other sources. Ascertainment is believed to be virtually complete for this period. Data on total live births in 1974 and 1975 by maternal age were obtained from the Division of Vital Statistics in British Columbia. Other information on the Registry and on data analysis has been given by Lowry et al. (1).

Results and Discussion

The maternal age distribution of all live births and live births with DS are shown in Table 1, for the additional years 1974-75, and for the complete four-year period 1972-75. Table 2 shows maternal age-specific rates of liveborn infants with Down's syndrome in the birth period of 1972-75. The values in the last three rows of Table 2 have been adjusted to the overall age distribution of the total number of live births from 1952-73. Figure 1 displays data from Tables 1 and 2 together with the previously published values for 1952-73. The broken lines in Figure 1 show the preliminary values obtained (1) during the period 1972-73 where these differ markedly.

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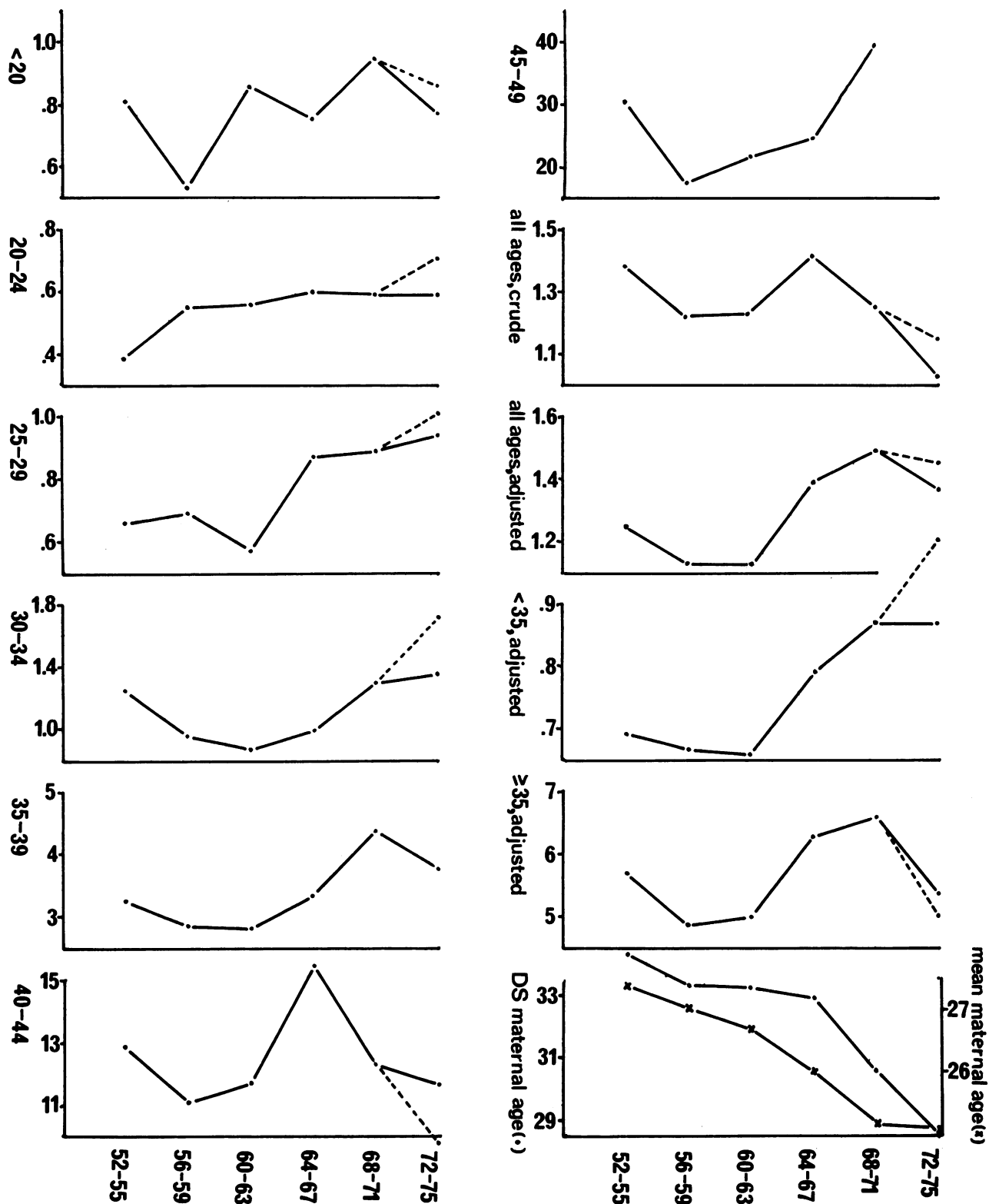


Figure 1. Trends in the age interval-specific incidence of DS, mean maternal age, and mean age of DS mothers in British Columbia from 1952-75. The data are grouped in four-year historical periods; the first five, and the sixth connected by the broken line (preliminary data), are from Lowry (1). Age intervals are 5 years, and age-specific rates are per 1000 livebirths.

Table 1. Maternal age distribution of all live births (LB) and live births with Down's syndrome (DS) in British Columbia in the periods 1974-75 and 1972-75.

| Maternal age | 1974-75 | | | | 1972-75 | | | |
|------------------|---------|------------------|------------|-------|---------|-------|------------|-------|
| | All LB | | LB with DS | | All LB | | LB with DS | |
| | No. | % | No. | % | No. | % | No. | % |
| < 20 | 8986 | 12.5 | 6 | 9.1 | 18297 | 13.0 | 14 | 9.7 |
| 20 - 24 | 25004 | 34.9 | 13 | 19.7 | 49600 | 35.3 | 29 | 20.0 |
| 25 - 29 | 25020 | 34.9 | 21 | 31.8 | 47936 | 34.1 | 45 | 31.0 |
| 30 - 34 | 9781 | 13.6 | 10 | 15.2 | 18553 | 13.2 | 25 | 17.2 |
| 35 - 39 | 2399 | 3.3 | 9 | 13.6 | 5054 | 3.6 | 19 | 13.1 |
| 40 - 44 | 506 | 0.7 | 7 | 10.6 | 1119 | 0.8 | 13 | 9.0 |
| 45 + | 28 | 0.0 ^a | — | 0.0 | 76 | 0.1 | — | 0.0 |
| Total age stated | 71724 | (100) | 66 | (100) | 140635 | (100) | 145 | (100) |
| Total | 71727 | | 66 | | 140642 | | 145 | |
| < 35 | 68791 | 95.9 | 50 | 75.8 | 134386 | 95.6 | 113 | 77.9 |
| ≥ 35 | 2933 | 4.1 | 16 | 24.2 | 6249 | 4.4 | 32 | 22.1 |
| Mean age | 25.1 | | 28.8 | | 25.1 | | 28.6 | |

^aLess than 0.05.

Table 2. Maternal age-specific rates of liveborn infants with Down's syndrome per 1000 live births in British Columbia, 1972-75.

| Age group | Rate/1000 LB |
|--------------------------------------|----------------|
| < 20 | 0.765 |
| 20 - 24 | 0.585 |
| 25 - 29 | 0.939 |
| 30 - 34 | 1.347 |
| 35 - 39 | 3.759 |
| 40 - 44 | 11.618 |
| 45 - 49 | — ^a |
| All ages (crude) | 1.031 |
| All ages (age-adjusted) ^b | 1.364 |
| < 35 (age-adjusted) | 0.867 |
| ≥ 35 (age-adjusted) | 5.392 |

^aInadequate sample size.

^bAdjusted to the age distribution of the total number of livebirths in the period 1952-73.

The marked downward trend in mean maternal age for DS individuals is confirmed. This has been observed in other studies (2, 3). There appear to be no major trends in the various age interval-specific rates examined, neither the five-year intervals nor the two combined intervals. In the cases where the preliminary 1972-73 data showed indications of a major trend, the addition of the extra data has dampened that trend. Slight upward trends visible in some cases

need to be interpreted with care since in 1964 and 1966 new ascertainment sources for DS became available. The influence of therapeutic abortions on these data is uncertain: these became legal in the province in 1971.

It appears that the decrease in mean age of DS mothers is best and most easily explained by the downward shift in the overall maternal age distribution, as reflected in the decreased mean maternal age. An identical conclusion has been stated by Kuroki et al. (2). Therefore, environmental mutagens are not necessary to explain the existing data, and if active and variable through this period their effects must be small.

However, continued monitoring of human populations for trends in the incidence of DS seems advisable. Further studies will also investigate possible parental occupational and geographical correlations.

REFERENCES

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